Medicaid Prior Authorization and Opioid Medication Abuse and Overdose

Gerald Cochran, PhD; Adam J. Gordon, MD, MPH; Walid F. Gellad, MD, MPH; Chung-Chou H. Chang, PhD; Wei-Hsuan Lo-Ciganic, PhD, MS, MSPharm; Carroline Lobo, MS; Evan Cole, PhD; Winfred Frazier, MD; Ping Zheng, MD, MS; David Kelley, MD; and Julie M. Donohue, PhD

ABSTRACT

OBJECTIVES: The US opioid medication epidemic has resulted in serious health consequences for patients. Formulary management tools adopted by payers, specifically prior authorization (PA) policies, may lower the rates of opioid medication abuse and overdose. We compared rates of opioid abuse and overdose among enrollees in plans that varied in their use of PA from "High PA" (ie, required PA for 17 to 74 opioids), with "Low PA" (ie, required PA for 1 opioid), and "No PA" policies for opioid medications.

STUDY DESIGN: Retrospective cohort study of patients initiating opioid treatment in Pennsylvania Medicaid from 2010 to 2012.

METHODS: Generalized linear models with generalized estimating equations were employed to assess the relationships between the presence of PA policies and opioid medication abuse and overdose, as measured in Medicaid claims data, adjusting for demographics, comorbid health conditions, benzodiazepine/muscle relaxant use, and emergency department use.

RESULTS: The study cohort included 297,634 enrollees with a total of 382,828 opioid treatment episodes. Compared with plans with No PA, enrollees in High PA (adjusted rate ratio [ARR], 0.89; 95% confidence interval [CI], 0.85-0.93; P <.001) and Low PA plans (ARR, 0.93; 95% CI, 0.87-1.00; P = .04) had lower rates of abuse. Enrollees in the Low PA plan had a lower rate of overdose than those within plans with No PA (ARR, 0.75; 95% CI, 0.59-0.95; P = .02). High PA plan enrollees were also less likely than No PA enrollees to experience an overdose, but this association was not statistically significant (ARR, 0.88; 95% CI, 0.76-1.02; P = .08).

CONCLUSIONS: Enrollees within Medicaid plans that utilize PA policies appear to have lower rates of abuse and overdose following initiation of opioid medication treatment.

Am J Manag Care. 2017;23(5):e164-e171

The US opioid medication epidemic has had serious effects on public health, including opioid-related overdoses and mortality.[1,2] Perhaps the largest system-level investment in the United States to address abuse and prevent overdose has been prescription drug monitoring programs,[3-5] which have shown mixed results for protecting patient health.[3,6,7] Another system-level intervention is a lock-in program, wherein patients who exceed filling pattern thresholds are limited to specific providers/pharmacies to receive future opioid medications[8]; this intervention has shown some promise for improving medication monitoring and reducing diversion.[9] Formulary management tools may represent a valuable set of interventions that payers can employ to control opioid medication consumption, deter shopping behaviors, and improve quality and safety.[10]

One formulary management tool that may be used to address the opioid crisis is prior authorization (PA), a requirement placed on some medications by payers to verify that the medication is necessary and/or patients meet the medical criteria for use.[11] An extensive body of literature has shown cost-saving benefits of PA policies for a variety of medications, often expensive name brand drugs[12,13]; however, limited research has been conducted on their impact on patient-related opioid and quality-of-care outcomes.[14-16] PA policies applied in public or commercial health insurance plans frequently result in reductions in medication use,[17-20] but this result is often accomplished by placing administrative burdens on clinicians.[21]

Medicaid programs serving low-income populations have federally allowable co-payments mandating that minimal out-of-pocket costs can be charged to enrollees.[22] Therefore, these programs are particularly reliant on PA policies, as opposed to other formulary management tools that use cost sharing to influence demand. Research has shown that approximately one-fourth of Medicaid patients who regularly use opioid medications (>90 days) are engaged in problematic opioid consumption behaviors.[23] On average, Medicaid enrollees receive more than double the total annual opioid dose compared with the privately insured.[24]

To date, 19 states' Medicaid programs have required PA for long-acting opioids, and study results show these policies can reduce long-acting opioid fills.[14-16] The extent to which PA policies can help reduce the problematic opioid-related outcomes of abuse and drug overdose is unknown. We hypothesized that enrollees within Medicaid fee-for service (FFS) programs and managed care plans employing PA policies for opioid medications would have lower rates of abuse and opioid medication overdose compared with patients enrolled in Medicaid plans without PA. Understanding the potential associations between PA and abuse and overdose may provide health systems and payers with an additional tool to address problematic opioid-related outcomes.

TAKEAWAY POINTS

Health insurance payers can implement policies to help curb the opioid epidemic. This retrospective cohort study of Pennsylvania Medicaid data examined the associations between Medicaid plans that utilized prior authorization (PA) policies for opioid medications and enrollees developing opioid medication abuse or experiencing overdose.

- Enrollees within plans that subjected opioid medications to PA policies had lower rates of opioid medication abuse and overdose after initiating opioid medication treatment.
- Future research should work to extend these findings in order to support systematic and large-scale implementation of PA policies for opioid medications.

METHODS

Design

This investigation was a retrospective cohort study that utilized Pennsylvania Medicaid data from 2010 to 2012. The Pennsylvania Medicaid program is among the largest in the United States in both expenditures and enrollment; the state's healthcare utilization, access,[25] and statewide demographic profile (with the exception of lower rates of Hispanics)[26] are similar to those seen across the nation. Pennsylvania has the eighth highest overdose rate in the country, and opioid prescribing rates are consistently above national averages.[1,27] We obtained Pennsylvania Medicaid data directly from the Pennsylvania Department of Human Services (PADHS) for all FFS and managed care enrollees.

We used Medicaid enrollment data and pharmacy/medical claims to establish an analytic cohort of Medicaid enrollees who initiated a new opioid medication not used for addiction treatment (**eAppendix** [eAppendices available at **ajmc.com**]). We included patients in the study cohort who were aged 18 to 64 years, not dually eligible for Medicare (given that we could not capture medication use for those >64 years and dually eligible), without previous cancer treatment, not in long-term care for 90 or more days, and not receiving hospice services (as opioid use patterns would likely differ for these groups). We identified the index opioid exposure event as patients' first oral, transdermal, or submucosal opioid medication fill.

To identify new episodes of opioid medication treatment, we excluded individuals from the cohort that possessed a record of filling any opioid medication, had an opioid use disorder, or experienced an opioid medication overdose in the 6 months prior to the index opioid fill. This step in the cohort construction allowed us to create a "clean" baseline period for patients before they were exposed to opioid medications and potentially developed abuse or experienced an overdose. Lapses in fills greater than 6 months following the index fill ended patients' eligible treatment episodes. We selected a 6-month gap in fills to end the episode to be consistent with prior studies validating this approach in behavioral health populations.[28] We examined numbers of patient episodes by plan PA status, and no major differences were detected (results not shown). This study was designated exempt by the University of Pittsburgh Institutional Review Board.

Variables

Outcomes. We identified opioid medication abuse following previously published approaches[29,30] using *International Classification of Diseases, 9th Edition* (*ICD-9*) coding classifications and pharmacy claims. After the index fill, enrollees who had any code for an opioid use disorder (304.0, 304.00, 304.01, 304.02, 304.03, 304.7, 304.70, 304.71, 304.72, 304.73, 305.5, 305.50, 305.51, 305.52, 305.53) or opioid medication poisoning (965.00 [opium poisoning], 965.02 [methadone poisoning], 965.09 [opiate poisoning—not elsewhere classified], E.850.1 [accidental methadone poisoning], and E.850.2 [accidental opioid poisoning—not elsewhere classified])[31] and had any overlapping fill for a opioid pain medication were categorized as having abuse (no abuse = 0, abuse = 1).[29,30] Patients meeting this definition of abuse have been observed to have both a heightened overdose risk[32] and serious behavioral, mental, and/or physical health problems.[29,30] We recognize this definition of abuse does not match the *Diagnostic and Statistical Manual for Mental Disorders* definition, but we chose to employ this term given its previous use in the literature.[29,30]

The opioid overdose indicator used in this analysis followed previously established methods for identifying prescription opioid overdose using *ICD-9* codes within claims data.[31] The overdose indicator occurred after the index opioid fill, comprised opioid medication poisoning codes (965.00, 965.02, 965.09, E.850.1, E.850.2), and was dichotomized (no overdose = 0, overdose = 1). These codes capture nonfatal and fatal overdose events resulting in hospitalization, emergency department (ED) visits, and/or other medical care. We did not capture overdose events outside of the healthcare system, which may have largely been untreated

TABLE 1. Summary Description of Prior Authorization by Plan

Plan	Number of Medications Subject to PA[a]	Earliest Date of Implementation[b]
Low PA plan		
Plan A	1[c]	1/2010
High PA plans		
Plan B	17	Prior to 2010
Plan C	74	Prior to 2010
No PA plans		
Plans D-I	None	N/A

N/A indicates not applicable; PA, prior authorization.
[a]Number of medications includes generic, name brand, and combination products.
[b]Date represents first date reported for any medication subjected to PA requirement.
[c]The single medication was OxyContin.

within Pennsylvania given the limited and variable availability of naloxone to public safety and prehospital healthcare professionals during the study years. We acknowledge that abuse and overdose are both constructed using poisoning claims and that there is some overlap between these measures; however, we chose this approach (ie, not removing the poisoning codes from the abuse indicator) to remain consistent with the previous literature.

PA indicator. Specification of plans in Pennsylvania Medicaid with PA took place in partnership with the Bureau of Managed Care within PADHS. Officials from PADHS provided FFS PA information and contacted all managed care plans (N = 8) via e-mail requesting historical formulary medication management policy information between January 1, 2010, and December 31, 2012. Qualitative responses were transferred into a data-tracking template. Given the variation in use of PA across plans in our study data, we followed an ordinal classification approach for categorization of policies similar to those previously employed in the literature.[33] One insurance plan was labeled "Low PA" (ie, required PA for 1 opioid); 2 plans were labeled "High PA" (ie, required PA for 17-74 opioids); and 6 plans were labeled "No PA" based on the number of generic, brand name, and combination product medications subjected to PA (**Table 1**). PA policies were active before or on the first day of our study observation period (January 1, 2010), thus limiting our ability to compare the differences among plans across time. We therefore conducted a cross-sectional comparison of enrollees across plan types.

Covariates. Covariates were measured in the enrollees' baseline periods. Demographic covariates included in the model were age (18-29, 30-39, 40-49, 50-64 years), sex, race/ethnicity (white, black, Hispanic, other), Medicaid eligibility category (General Assistance, Supplemental Security Income, Temporary Assistance for Needy Families), Medicaid plan type (FFS, managed care organization), and urban/rural county of residence (coded using Rural-Urban Continuum Codes[34,35]).

We likewise included measures of comorbidity in the models, which were also measured at baseline. Specific comorbidities included: alcohol use disorders (abuse/dependence), nonopioid drug use disorders (abuse/dependence [eg, cocaine, marijuana] not including Not Elsewhere Classified codes, which clinicians may have used in lieu of opioid use disorder codes), several indicators for mental health disorders (adjustment, anxiety, mood, personality, miscellaneous), separate indicators for pain diagnoses (back, neck, arthritis/joint, headache/migraine), and HIV/AIDS.[36] We included in the model a modified Elixhauser Comorbidity Index, an indicator that used *ICD-9* codes to measure patient comorbidity within administrative claims data from hospitals and physician services. This indicator was modified by removing comorbidities described above that we included as individual covariates. ED use was also included in the model (≥1 visit = 1, <1 visit = 0).

We included morphine milligram equivalents (MME) following the index fill but before the occurrence of abuse or overdose. MME was constructed by converting the total within-episode opioid supply into morphine equivalents, dividing by the days' supply, and coding into 4 levels: ≥100 MME/day, 50 to <100 MME/day, 20 to <50 MME/day, <20 MME/day.[37] Indicators of medication use that are known correlates with abuse/overdose were also added as covariates in the model, which included any use of benzodiazepines and muscle relaxants in the baseline period. All covariates were categorical with the exception of the Elixhauser Comorbidity Index, which was a count indicator, and age, which was ordinal.

Analyses

With the exception of descriptive demographic characteristics that were calculated at the person level for patients enrolled in the 3 PA plan types, analyses for this study were conducted at the episode level. Our modeling strategy needed to account for 2 features of our data: heterogeneity in the duration of opioid use across episodes and some enrollees having multiple episodes. The importance of accounting for episode-level events for individual enrollees is based on the dynamic nature of patient behaviors and health status across time, which can alter an individual's risk. We therefore employed generalized linear models with generalized estimating equations (GEE) using log link function and Poisson distribution where follow-up length (day) was treated as offset in the model, and the exchangeable covariance structure was employed to account for standard error correlation.

These models were able to account for greater exposure to opioids and PA policies within an episode and greater numbers of episodes, and they were applied to examine the association between the outcome variables of opioid medication: 1) abuse and 2) overdose and the predictor variable of PA adjusted for all covariates described above. We also report abuse and overdose rates with 95% confidence intervals (CIs) by PA type adjusted for all covariates and offset log length of episode. All analyses were conducted with SAS version 9.4 (SAS Institute; Cary, North Carolina).

In an alternative model specification, we estimated both the abuse and overdose outcome analyses using a propensity score matching approach wherein we matched individuals in the High and Low PA plans to those in No PA plans. Results showed no substantive differences; therefore, we chose to present the adjusted GEE results instead of the matched sample for the purpose of simplicity and to maximize the sample size included in our analyses.

RESULTS

The analytic cohort included 297,634 individual plan enrollees with a total of 382,828 opioid treatment episodes. Many enrollees within the cohort had multiple opioid treatment episodes, with patients having an average of 2 episodes (median = 1; results not shown). **Table 2** presents descriptive patient-level demographic and episode-level health and medication use characteristics. The largest proportions of patients were aged 18 to 29 years (n = 140,876; 47.3%) and were female (n = 212,209; 71.3%). The largest proportional differences among PA plans were in race and rural/urban living location. White enrollees were most prominent in High PA plans (77.2%; n = 79,965), and Black (47.9%; n = 15,950) and Hispanic (31.2%; n = 10,386) enrollees were most prominent in the Low PA plan. Most Low (99.9%; n = 33,226) and No PA (95.1%; n = 152,913) enrollees lived in urban locations compared with 63.7% (n = 65,948) of High PA plan enrollees.

The most common level of opioid consumption within episodes (60.9%-68.6%) was 20 to 49.9 MME per day following the index opioid fill. The unadjusted rate of abuse within episodes was 3.46 for High PA plans, 2.36 for the Low PA plan, and 3.39 for the No PA plans after the index opioid medication fill. The unadjusted rate of overdose in episodes was 0.26 in High PA plans, 0.19 for the Low PA plan, and 0.29 in No PA plans after the index fill (**Table 3**).

Table 4 shows the results of the GEE analyses adjusted for demographic and health status differences across plan types, which demonstrated that individuals in High PA plans were 11% less likely to develop opioid medication abuse after their index opioid medication fill compared with those within plans with No PA (95% CI = 0.85-0.93; P <.001). Enrollment in the Low PA plan was also associated with a 7% lower rate of developing opioid medication abuse after the opioid medication index fill (95% CI, 0.87-1.00; P = .04) relative to No PA.

TABLE 2. Demographic, Behavioral Health Characteristics, and Comorbidities by Level of Prior Authorization

Characteristics	Total, n (%)	High PA, n (%)	Low PA, n (%)	No PA, n (%)
Patient Level[a]	297,634 (100.0)	103,587 (34.8)	33,270 (11.2)	160,777 (54.0)
Demographics				
Age, years				
18-29	140,876 (47.3)	50,946 (49.2)	13,619 (40.9)	76,311 (47.5)
30-39	66,258 (22.3)	23,366 (22.6)	7188 (21.6)	35,704 (22.2)
40-49	47,584 (16.0)	15,696 (15.2)	6130 (18.4)	25,758 (16.0)
50-64	42,916 (14.4)	13,579 (13.1)	6333 (19.0)	23,004 (14.3)
Female	212,209 (71.3)	73,891 (71.3)	23,568 (70.8)	114,750 (71.4)
Race				
White	167,175 (56.2)	79,965 (77.2)	5418 (16.3)	81,792 (50.9)
Black	83,874 (28.2)	14,641 (14.1)	15,950 (47.9)	53,283 (33.1)
Hispanic	35,885 (12.1)	6416 (6.2)	10,386 (31.2)	19,083 (11.9)
Other	10,700 (3.6)	2565 (2.5)	1516 (4.6)	6619 (4.1)
Urban	252,087 (84.7)	65,948 (63.7)	33,226 (99.9)	152,913 (95.1)
Type of eligibility				
GA	32,256 (10.8)	9162 (8.8)	5075 (15.3)	18,019 (11.2)
SSI	86,785 (29.2)	31,167 (30.1)	10,702 (32.2)	44,916 (27.9)
TANF	178,593 (60.0)	63,258 (61.1)	17,493 (52.6)	97,842 (60.9)
Medicaid region				
Region 1	54,475 (18.3)	13,233 (12.8)	112 (0.3)	41,130 (25.6)
Region 2	38,602 (13.0)	36,791 (35.5)	–[b]	–[b]
Region 3	26,861 (9.0)	23,346 (22.5)	–[b]	–[b]
Region 4	104,890 (35.2)	8780 (8.5)	33,044 (99.3)	63,066 (39.2)
Region 5	72,806 (24.5)	21,437 (20.7)	32 (0.1)	51,337 (31.9)
Episode Level[c] (n = 382,828)				
Behavioral and mental health				
Alcohol use disorder	9973 (2.6)	3342 (2.6)	978 (2.3)	5653 (2.7)
Drug use disorder	8795 (2.3)	2383 (1.8)	1058(2.5)	5354 (2.5)
Adjustment disorders	8509 (2.2)	3274 (2.5)	810 (1.9)	4425 (2.1)
Anxiety disorders	39,604 (10.4)	13,958 (10.8)	4102 (9.5)	21,544 (10.2)
Mood disorders	84,437 (22.1)	28,332 (21.9)	10,970 (25.5)	45,135 (21.4)
Personality disorders	2034 (0.5)	847 (0.7)	109 (0.3)	1078 (0.5)
Miscellaneous mental health disorders	12,082 (3.2)	3957 (3.1)	1522 (3.5)	6603 (3.1)

(continued)

TABLE 2. Demographic, Behavioral Health Characteristics, and Comorbidities by Level of Prior Authorization *(continued)*

Characteristics	Total, n (%)	High PA, n (%)	Low PA, n (%)	No PA, n (%)
Painful conditions and healthcare utilization				
Back pain	67,346 (17.6)	22,971 (17.8)	8294 (19.3)	36,081 (17.1)
Neck pain	23,822 (6.2)	8246 (6.4)	2738 (6.4)	12,838 (6.1)
HIV/AIDS	3525 (0.9)	495 (0.4)	878 (2.0)	2152 (1.0)
Arthritis/joint pain	76,691 (20.0)	25,312 (19.6)	9468 (22.0)	41,911 (19.9)
Headache/migraine pain	15,514 (4.1)	5722 (4.4)	1380 (3.2)	8412 (4.0)
ED visit	180,045 (47.0)	59,237 (45.8)	20,528 (47.7)	100,280 (47.6)
Medication use				
Benzodiazepine use	55,986 (14.6)	18,287 (14.2)	7317 (17.0)	30,383 (14.4)
Muscle relaxant use	36,597 (9.6)	12,555 (9.7)	4484 (10.4)	19,558 (9.3)
Comorbidity				
Elixhauser Index[d]	1.12 (1.62)	1.07 (1.57)	1.42 (1.84)	1.09 (1.59)

ED indicates emergency department; GA, General Assistance; SSI, Supplemental Security Income; TANF, Temporary Assistance for Needy Families.
[a]Measured at the person level, n = 297,634.
[b]Numbers are suppressed if cell sizes are less than 11 or could be used to identify a cell size less than 11.
[c]Measured at the event level, n = 382,828.
[d]Mean (standard deviation).

TABLE 3. Postindex Fill Unadjusted Rates of Abuse,[a] Overdose,[a] and Morphine Milligram Equivalents[b] by Prior Authorization Type[c]

Indicator	No Prior Authorization	Low Prior Authorization	High Prior Authorization
Abuse	3.39	2.36	3.46
Overdose	0.29	0.19	0.26
MME per day			
<20	17.0	21.8	15.4
20-49.9	67.9	60.9	68.6
50-99.9	12.6	14.8	13.4
≥100	2.5	2.6	2.6

MME indicates morphine milligram equivalent.
[a]Abuse and overdose rates are calculated after the index fill.
[b]MMEs are calculated after the index fill and before abuse and overdose occur.
[c]Analyses conducted at the episode level.

In terms of the relationship between PA and overdose, enrollment in the Low PA plan was associated with a 25% lower rate of experiencing an overdose following the index opioid medication fill (95% CI = 0.59-0.95; P = .02). There was a nonsignificant 12% reduction (95% CI = 0.76-1.02; P = .08) in overdose for enrollees in High PA plans. We recognize that the High PA plans had the highest unadjusted rate of abuse, but after adjustment, the No PA plan had the highest. To identify which set of covariates influenced this change, we re-estimated our model by adding blocks of variables to the model in a stepwise fashion (eg, block 1 = abuse, overdose, and MME; block 2 = demographics; block 3 = mental/behavioral health and co-occurring health conditions [ie, pain, Elixhauser Index]). Results showed that adding the demographic block resulted in the change. We also re-estimated the GEE analyses without the MME covariate to examine its influence on model outcomes. The magnitude and direction of all effects were unchanged after removing MME.

Table 5 reports adjusted rates based on the GEE analyses for abuse and overdose per person-days (where 452.1 [standard deviation = 299.2] was the average number of per-person follow-up days for subjects in the cohort). The adjusted rates of abuse were 2.49% for High PA plans, 2.58% for the Low PA plan, and 2.76% for No PA plans per average person-days. The adjusted rates of overdose were 0.21% for High PA plans, 0.17% for the Low PA plan, and 0.23% for No PA plans per average person-days.

DISCUSSION

The opioid medication epidemic has brought to the forefront of healthcare practice and policy the need to identify and intervene with patients engaged in abuse and at risk for overdose. Policy-level efforts that limit access to opioid medications and influence patient and prescriber behaviors have the potential to make an important impact on reducing negative patient outcomes. We analyzed data from Medicaid enrollees who developed opioid pain medication abuse or experienced an overdose after initiating opioid treatment who were within plans that utilized PA policies compared with plans that did not. Our findings showed a minority of plans implemented PA policies (3 of 9 plans) and there was substantial variation in the number of medications within plans subjected to PA policies (range = 1-74).

Enrollment in High and Low PA plans was associated with modestly lower adjusted rates of opioid medication abuse, and enrollment in the Low PA plan was associated with lower adjusted rates of overdose. These results are consistent with those of previously published studies that have examined the effects of PA on opioid medication fills. Specifically, our findings that PA was associated with 7% to 11% (P <.05) lower rates of abuse and 12% (P = .08) to 25% (P = .02) lower rates of overdose are consistent with studies that have reported 8% to 19% reductions in long-acting opioid medication fills among enrollees in plans that utilized PA policies.[14,15]

TABLE 4. Generalized Estimating Equation Estimates for Opioid Abuse[a] and Overdose[b] Adjusted for All Covariates and Offset by Log Length of Episode[c]

	Abuse		Overdose	
Predictor	**ARR (95% CI)**	***P***	**ARR (95% CI)**	***P***
Prior authorization (ref = No PA)				
Low	0.93 (0.87-1.00)	.04	0.75 (0.59-0.95)	.02
High	0.89 (0.85-0.93)	<.001	0.88 (0.76-1.02)	.08
Categorical MME,[d] MME per day (ref = <20)				
20-49.9	1.05 (1.00-1.10)	.06	0.97 (0.82-1.16)	.77
50-99.9	1.17 (1.10-1.25)	<.001	1.42 (1.15-1.75)	.001
≥100	2.12 (1.97-2.28)	<.001	2.58 (2.04-3.27)	<.001
Demographics				
Race (ref = other)				
White	2.12 (1.86-2.42)	<.001	1.41 (0.92-2.16)	.11
Black	0.92 (0.80-1.05)	.21	0.90 (0.58-1.40)	.65
Hispanic	0.81 (0.70-0.93)	.004	0.62 (0.38-1.01)	.06
Female	0.70 (0.67-0.73)	<.001	0.87 (0.75-1.00)	.04
Age, years	0.86 (0.85-0.88)	<.001	0.99 (0.93-1.05)	.73
Urban	1.13 (1.07-1.19)	<.001	1.33 (1.10-1.62)	.004
Eligibility type (ref = TANF)				
GA	1.77 (1.67-1.86)	<.001	1.58 (1.28-1.94)	<.001
SSI	0.94 (0.90-0.98)	.005	1.26 (1.08-1.48)	.004
Mental/behavioral health				
Alcohol abuse/dependence	1.42 (1.32-1.54)	<.001	1.47 (1.14-1.90)	.003
Nonopioid drug use disorder	2.08 (1.92-2.24)	<.001	1.26 (0.92-1.71)	.15
Adjustment disorders	1.12 (1.01-1.23)	.03	1.11 (0.81-1.53)	.51
Anxiety disorders	1.21 (1.16-1.27)	<.001	1.26 (1.07-1.48)	.005
Mood disorders	1.41 (1.35-1.48)	<.001	1.29 (1.12-1.50)	<.001
Personality disorders	0.97 (0.83-1.13)	.69	0.87 (0.50-1.52)	.63
Miscellaneous mental health disorders	1.05 (0.96-1.14)	.31	1.01 (0.74-1.38)	.95
Painful conditions and healthcare utilization				
Back pain	1.26 (1.21-1.31)	<.001	1.29 (1.12-1.49)	<.001
Neck pain	1.06 (1.00-1.12)	.04	1.17 (0.98-1.41)	.08
HIV/AIDS	1.68 (1.45-1.94)	<.001	1.04 (0.59-1.85)	.89
Arthritis/joint pain	0.95 (0.91-0.99)	.01	1.13 (0.99-1.30)	.07
Headache/migraine pain	0.95 (0.88-1.02)	.17	0.99 (0.77-1.28)	.96
Health services/comorbidity				
ED visit	1.28 (1.23-1.33)	<.001	1.43 (1.25-1.63)	<.001
Medication use				
Benzodiazepine use	1.73 (1.66-1.81)	<.001	2.12 (1.82-2.46)	<.001
Muscle relaxant use	1.18 (1.13-1.24)	<.001	1.40 (1.20-1.64)	<.001
Comorbidity				
Elixhauser Index	0.94 (0.92-0.95)	<.001	1.06 (1.02-1.10)	.004

ARR indicates adjusted rate ratio; CI, confidence interval; ED, emergency department; MME, morphine milligram equivalent; PA, prior authorization; ref, reference; GA, General Assistance; SSI, Supplemental Security Income; TANF, Temporary Assistance for Needy Families.
[a]Number of abuse events is 12,631.
[b]Number of overdose events is 1024.
[c]Analyses conducted at the episode-level.
[d]MME/day observed before abuse or overdose.

TABLE 5. Abuse and Overdose Rate With 95% CI by Prior Authorization Adjusted Rate Ratio for All Covariates and Offset by Log Length of Episode (day)[a,b]

Indicator	ARR[b]	(95% CI)
Abuse		
High PA	2.49	(2.35-2.62)
Low PA	2.58	(2.40-2.76)
No PA	2.76	(2.67-2.89)
Overdose		
High PA	0.21	(0.17-0.25)
Low PA	0.17	(0.14-0.22)
No PA	0.23	(0.20-0.27)

ARR indicates adjusted rate ratio; CI, confidence interval; PA, prior authorization.
[a]Average number of follow-up days for subjects = 452.1 (standard deviation = 299.2).
[b]Analyses conducted at the episode level.

A central point of importance for our findings is that they advance previous studies reporting reductions in long-acting opioid medication fills, which is an outcome metric with limited ability to differentiate between patients with problematic use and those who may benefit from opioid medications. Assessing only fills as an outcome also cannot disentangle patient and prescriber behaviors. Accordingly, evaluating the benefits of PA policies by changes in abuse and overdose more effectively discriminates reductions in potential repercussions of opioid use—perhaps demonstrating an outcome especially relevant to combatting the national opioid epidemic. Further, reductions in abuse, for example, could have valuable ramifications for health systems, payers, and prescriber stakeholders as patients with opioid use disorders have higher healthcare needs, utilization, and costs.[38]

Future research should seek to extend our findings by examining the effect of PA within an analytical framework capable of examining both within- and between-group differences over time. Such studies should seek to account for legitimate pain management needs of patients. In particular, although abuse and overdose are both important outcomes for patient safety and health, future studies should examine potentially unintended consequences of PA plans on patients, such as undertreatment of painful conditions[39] or transition to heroin use.[2] If future research continues to provide support for PA, broader implementation of these policies may necessitate streamlined and automated approaches to minimize the disruption to the medical/pharmacy workflow.[21]

Limitations

These findings should be viewed in light of certain limitations. First, while we recognize that the strengths of our study include possessing actual PA information from Medicaid plans, having complete FFS and managed care data, and Pennsylvania being similar to other programs in the nation with respect to healthcare utilization, access,[25] and demographics,[26] it nonetheless represents 1 state in the United States.

Second, the last year for our data was 2012, and some analyses have shown reductions in opioid abuse and diversion in more recent years.[46] Furthermore, the larger Medicaid landscape has evolved since this date, including the expansion of Medicaid through the Affordable Care Act in Pennsylvania and many other states. Studies conducted with more recent data may yield different estimates as a result of these changes. PADHS also recently implemented additional restrictions on opioids[41,42] that may yield even greater benefit. However, these policies went into effect after our study period ended so we were unable to evaluate them.

Third, we used a simple and straightforward approach to categorizing PA schemes (High, Low, and No based on the number of products subject to PA). It is possible our data collection method did not capture other aspects of these policies, such as the ease of use that may influence prescribing behavior. It is also possible that we did not capture information on all plan features or policies that may influence opioid prescribing and use. In light of this, we recognize our characterization of the policies may not capture the full range of interventions plans may have had in place. We note, however, that enrollees with evidence of opioid medication misuse have an equal possibility of enrollment in the state Medicaid agency-operated lock-in program.

Fourth, whereas the abuse measure is one of the more common and valid indicators in the field,[43] it has the potential to misclassify individuals engaged in legitimate use of opioids. Moreover, while we have been able to adjust for a number of patient-level characteristics in our analyses that could have introduced bias into our findings, other individual-level factors and regional variations in our outcomes could have influenced study outcomes. Future research should seek to employ quasi-experimental designs with comparison groups, such as difference-in-differences analyses, to help better understand the impact of PA.

Last, we recognize opioid use disorders are likely undercoded within claims data[47] and claims data do not account for cash payments to prescribers/pharmacies, which could influence observed associations were these data available.[48]

CONCLUSIONS

This study examined associations between PA requirements and developing abuse or experiencing an opioid medication overdose following an index opioid medication fill for Medicaid enrollees. These findings extend previous research by demonstrating improved outcomes among patients within PA plans in terms of lower rates of abuse and overdose. Future research should seek to extend these findings within more rigorous causal designs/analyses and among other Medicaid and commercial payer data to continue building evidence for PA policies reducing problematic opioid behaviors and consequences.

Author Affiliations: School of Social Work (GC), and School of Medicine (C-CHC), Department of Psychiatry (GC), and School of Medicine, Division of General Internal Medicine (AJG, WFG, WF), and Center for Pharmaceutical Policy and Prescribing (GC, AJG, WFG, JMD), and Graduate School of Public Health (C-CHC, CL, EC, PZ, JMD), University of Pittsburgh, Pittsburgh, PA; VA Pittsburgh Healthcare System (AJG, WFG), Pittsburgh, PA; University of Arizona, College of Pharmacy (WL-C), Tucson, AZ; Pennsylvania Department of Human Services, Medical Assistance Programs (DK), PA.

Source of Funding: Centers for Disease Control and Prevention (U01CE002496).

Author Disclosures: Dr Gordon has received grants from NIH, VA, and other public grants; the contents do not represent views of the US department of Veterans Affairs or the US government. The affiliations listed above were accurate for Dr Gordon during the preparation of hte manuscript; he has since moved to the University of Utah School of Medicine and the Informatics, Decision Enhancement and Analytic Sciences Center, VA Salt Lake Health Care System, Salt Lake City, UT. The remaining authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (GC, AJG, WFG, WF, DK, JMD); acquisition of data (GC, PZ, JMD); analysis and interpretation of data (GC, AJG, WFG, WL-C, DK, CL, EC, WF, PZ, JMD); drafting of the manuscript (GC, AJG, C-CHC, WL-C, CL, JMD); critical revision of the manuscript for important intellectual content (GC, AJG, WFG, WL-C, CL, EC, WF, DK, JMD); statistical analysis (GC, C-CHC, WL-C, PZ); obtaining funding (GC, JMD); administrative, technical, or logistic support (EC, JMD); and supervision (JMD).

Address Correspondence to: Gerald Cochran, PhD, University of Pittsburgh, 4200 Forbes Ave, 2117 CL, Pittsburgh, PA 15260. E-mail: gcochran@pitt.edu. ■

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